Length Frequency

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Data Preparation

I will now compare the length frequency distribution for largemouth bass obtained in the nearshore electrofishing survey during 2013 - 2016.

```
lmb <- read.csv("Data/Clean-Data/2012-2017_nearshore-survey-largemouth-bass_CLEAN.csv") %>%
    arrange(Year, FID, Length)
lmb$fyr <- as.factor(lmb$fyr)
```

```
unique(lmb$Year) ### See that there is no 2013
```

```
## [1] 2012 2013 2014 2015 2016 2017
```

Lets create a new variable for 20 mm length bins.

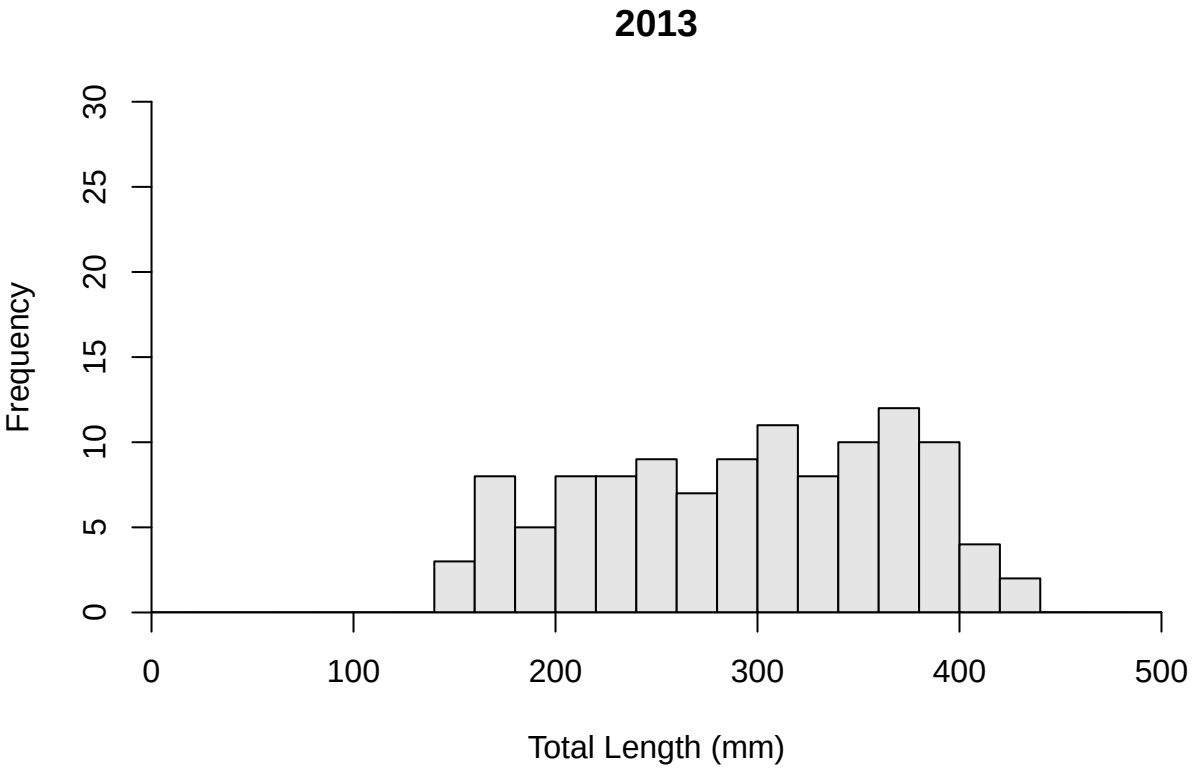
```
lmb %<>% mutate(lcat20 = lencat(Length, w = 20))
```

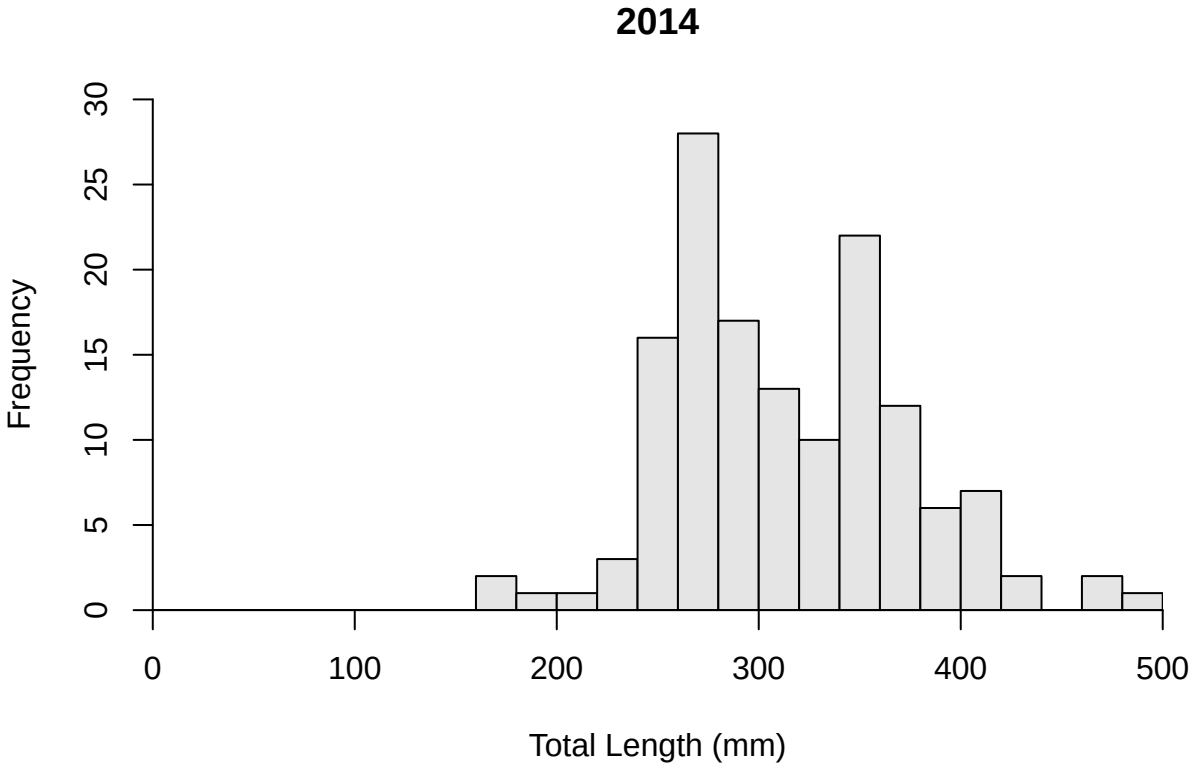
Now I want to separate out the years. I will throw out the year 2012 because samples from this years were not collected using the same procedures as in subsequent years. On ly large LMB from 2012 had length weigh data.

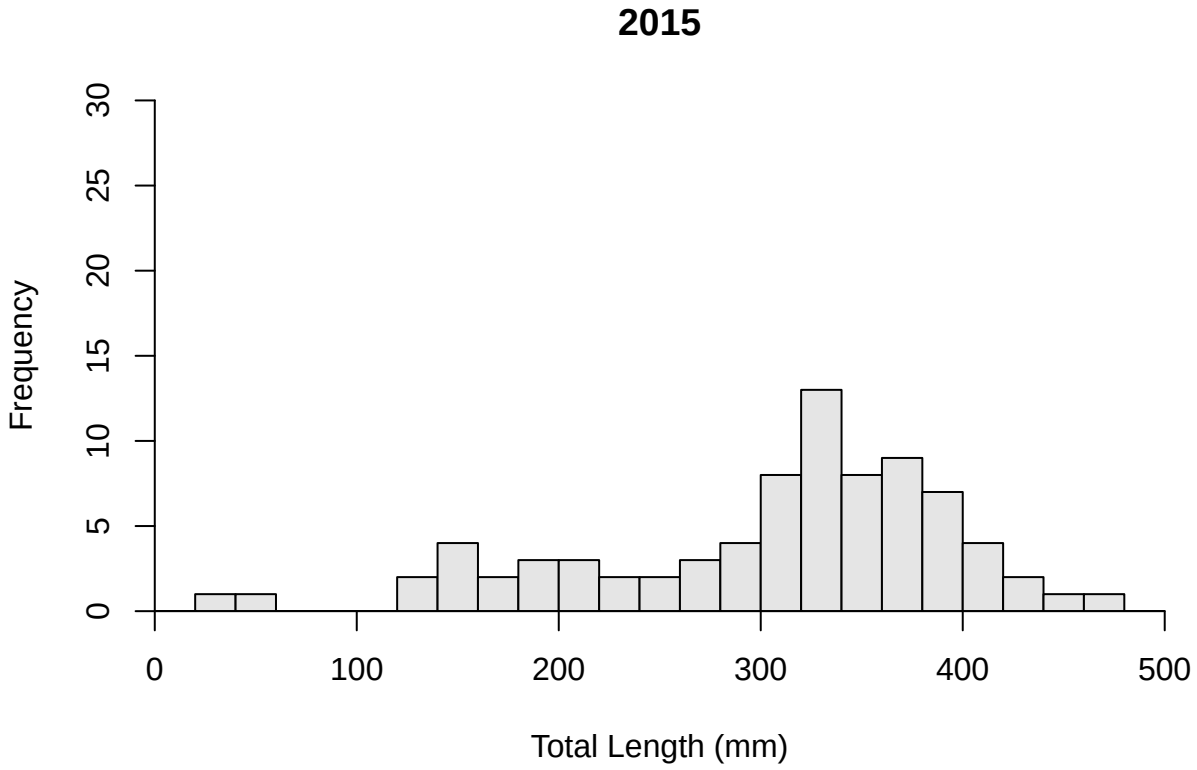
```
lmb.12 <- filter(lmb, Year == 2012)
# 1-8-2018#write.csv(lmb.12, file = 'Data/Clean-Data/minor-data/lmb.12.csv')
lmb.13 <- filter(lmb, Year == 2013)
# 1-8-2018#write.csv(lmb.13, file = 'Data/Clean-Data/minor-data/lmb.13.csv')
lmb.14 <- filter(lmb, Year == 2014)
# 1-8-2018#write.csv(lmb.14, file = 'Data/Clean-Data/minor-data/lmb.14.csv')
lmb.15 <- filter(lmb, Year == 2015)
# 1-8-2018#write.csv(lmb.15, file = 'Data/Clean-Data/minor-data/lmb.15.csv')
lmb.16 <- filter(lmb, Year == 2016)
# 1-8-2018#write.csv(lmb.16, file = 'Data/Clean-Data/minor-data/lmb.16.csv')
lmb.17 <- filter(lmb, Year == 2017)
# 1-10-2018#write.csv(lmb.17, file =
# 'Data/Clean-Data/minor-data/lmb.17.csv')
```

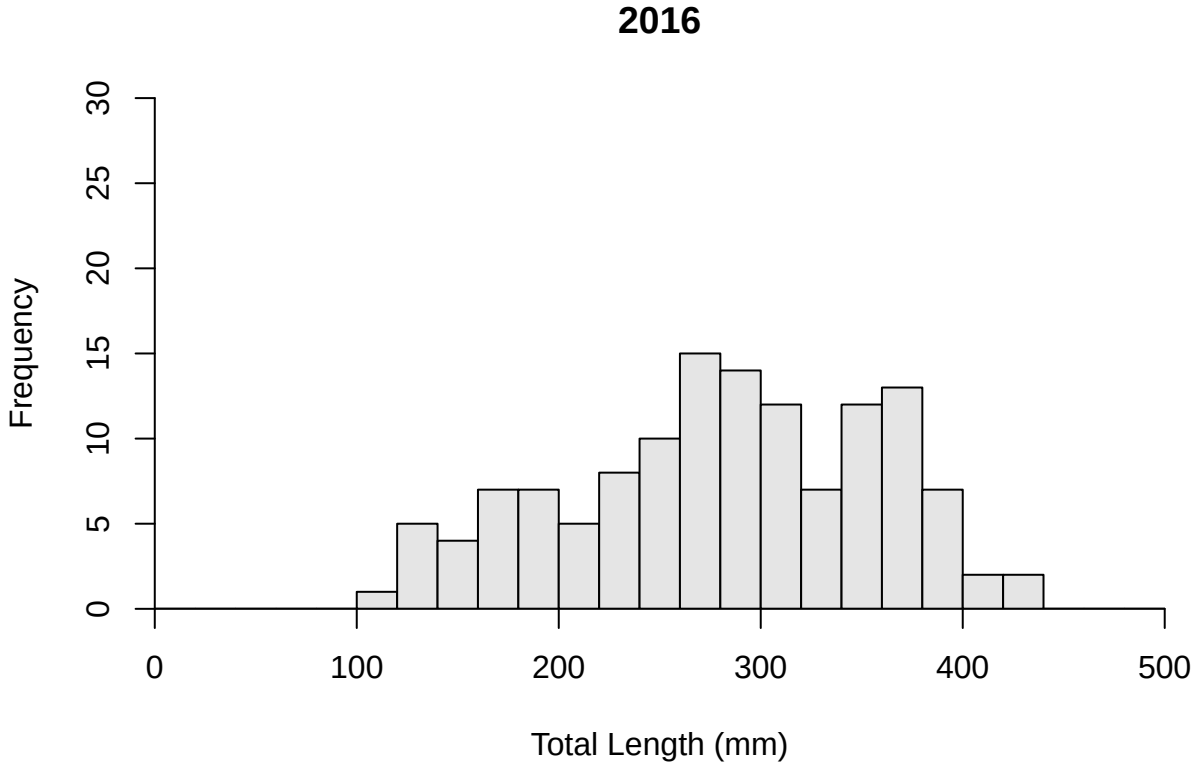
Length Frequency Distribution

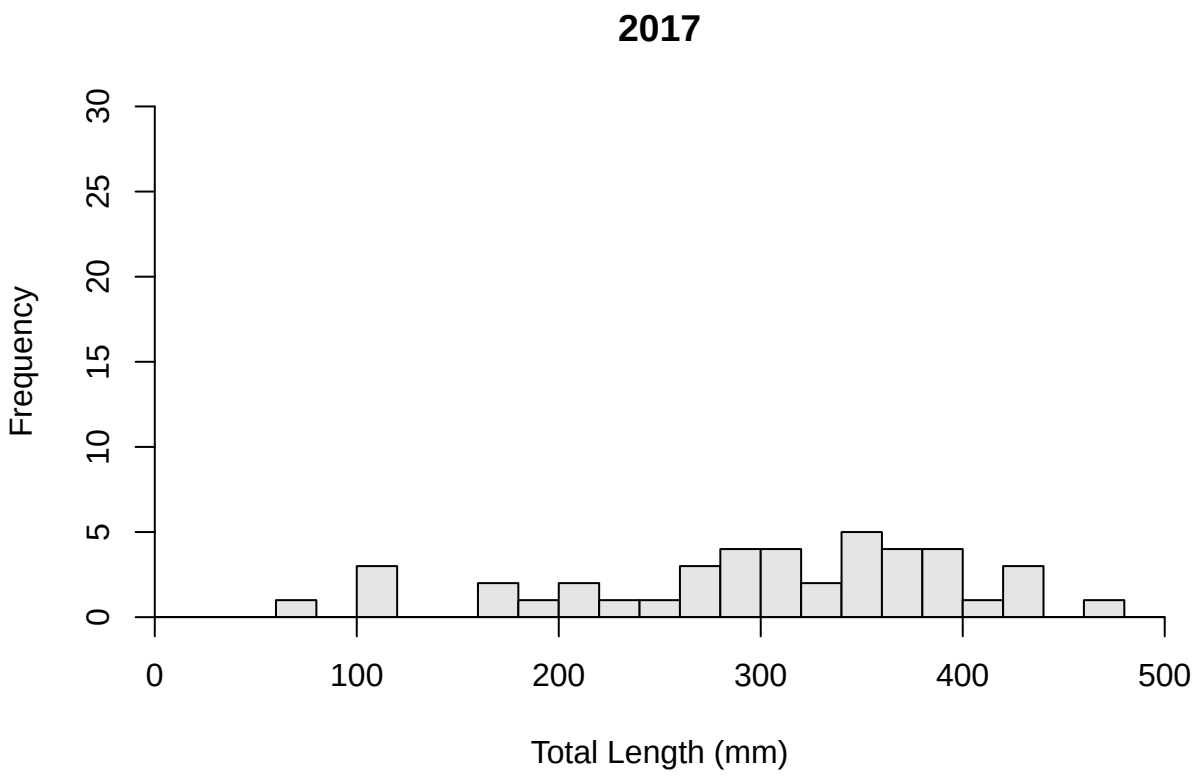
Lets view a quick histogram of the frequency of fish in each length bin.






2015
Frequency
0
5
10
15
20
25
30
0
100
200
300
400
500
Total Length (mm)

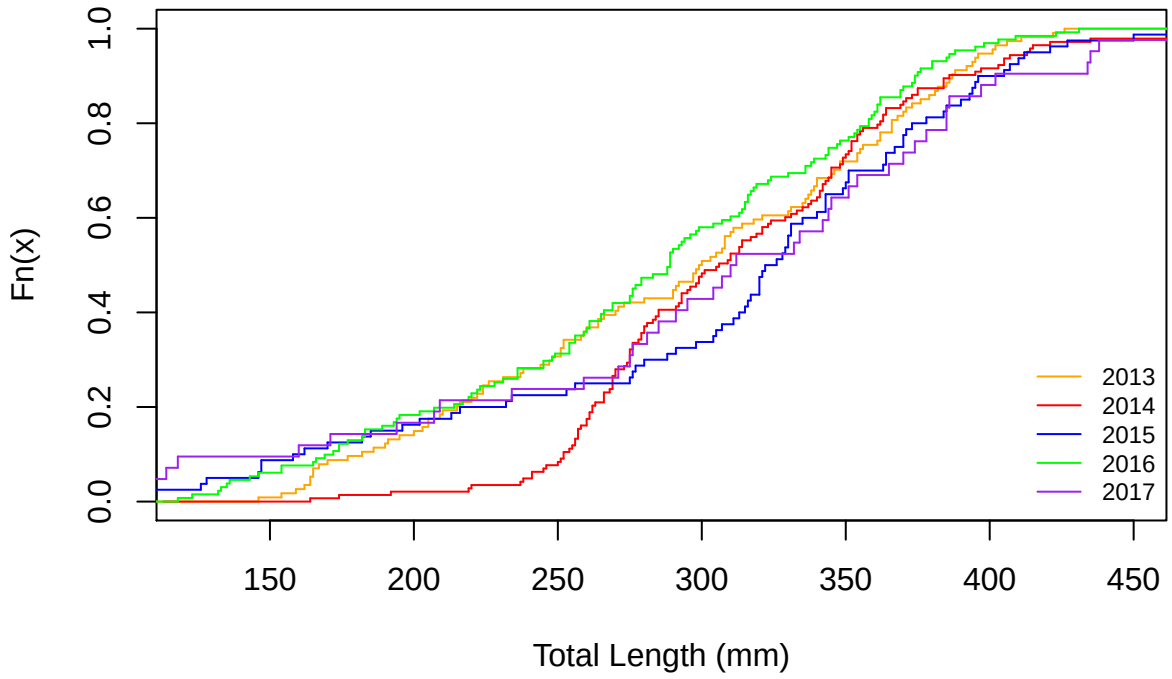

2016
Frequency
0
5
10
15
20
25
30
0
100
200
300
400
500
Total Length (mm)



There may be a problem where small fish (<100 mm) are not being captured by our gear dispite some being present in 2015. 2014 and 2016 look fairly similar to me and 2015 doesn't look too far off. With my limited expirience in these matters I would have to say the largemouth bass population looks stable. But lets continue to check this in a less qualitative manner.

Cumulative Frequencies

Lets look at the empirical cumulative distribution function (ECDF). This is the proportion of fish less than each observed length. This should help me compare the length frequency distributions between years.



Compare Length Frequency Between Years

Kolmogorov-Smirnov Test

```
##  [1] 0.23721016 0.19517544 0.09997322 0.14160401 0.19003497 0.24747771
##  [7] 0.20313020 0.24265267 0.13630952 0.17084696
```

```
##  [1] "13-14" "13-15" "13-16" "13-17" "14-15" "14-16" "14-17" "15-16"
##  [9] "15-17" "16-17"
```

```
(p.yr <- data.frame(yrs, D, p.val))
```

```
##      yrs          D       p.val
## 1  13-14 0.23721016 0.014291577
## 2  13-15 0.19517544 0.344309858
## 3  13-16 0.09997322 1.000000000
## 4  13-17 0.14160401 1.000000000
## 5  14-15 0.19003497 0.344309858
## 6  14-16 0.24747771 0.004613498
## 7  14-17 0.20313020 0.686011563
## 8  15-16 0.24265267 0.046126129
## 9  15-17 0.13630952 1.000000000
## 10 16-17 0.17084696 1.000000000
```

Summary of Results

The results of the Kolmogorov-Smirnov test above seem to suggest the largemouth bass population is not stable (*Or is it? I think there are just a few weird years probably sampling related*). The length frequency distribution **is significant different** between the years 2013 and 2014 (D = 0.24, P = 0.014), 2014 and 2016 (D = 0.25, P < 0.005), and 2015 and 2016 (D = 0.24, P = 0.046). There is **no significant differnce** between the length frequency distributions for 2013 and 2015 (D = 0.20, P = 0.344), 2013 and 2016 (D = 0.10, P = 1), and 2014 and 2015 (D = 0.19, P = 0.344). The length frequency distribution for the year 2017 was *not significantly different* between any years.

Note: *Adding in the Year 2017 Significantly Altered the Adjusted P-Values*